



**CSM LEARN**  
High Performance, for everyone

CSM introduces a number of significant improvements to adaptive, personalized learning, extending to the goals of instruction. This paper provides a brief introduction to these innovations.

## CSM: NEXT-GENERATION ADAPTIVE LEARNING

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An introduction

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## CSM overview – the virtuous cycle of High Performance

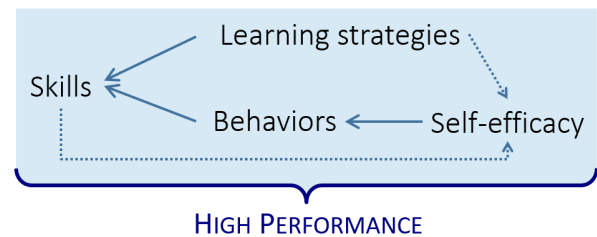
CSM builds High Performance essentials using next-generation adaptive learning.

- CSM teaches math, literacy and problem-solving **skills** that truly matter in school, college, work and life. Many of the skills taught (mental math, text scanning, “logic” problems) are rarely taught in most curricula, yet should be used every day by adults.
- CSM teaches **learning strategies** and meta-cognition – e.g. deciding what lessons to read, when to read them, and how deeply to read them; accuracy in self-assessment of when you know the skill; planning and goal-setting; an exploration mindset; and more.
- A student without good **learning behaviors** won’t consistently employ their learning strategies – such behaviors include attention-to-detail, conscientiousness, persistence, self-reliance, resilience, and more.
- Student behaviors are usually a response to their **affect** (feelings) and **self-identity**, including personal high expectations, growth mindset, intrinsic motivation, and most importantly **self-efficacy**: the belief that you can succeed when you set your mind to it. To illustrate the effect of these factors on behavior, when a student who doesn’t believe that they’ll succeed hits a minor speedbump, this affirms their deeply-held suspicions of likely failure and they show very poor persistence and resilience. CSM throws the kitchen sink of educational psychology and behavioral economics at these affective and self-identity issues.
- There are many feedback mechanisms within the process. For example, when students are successful at acquiring skills, their self-efficacy, feeling of belonging, and intrinsic motivation improve. Additionally, if a student has good learning strategies, they feel more in control and their self-efficacy improves.

**High Performance**

- Fluent math and literacy
- Problem-solving
- The ability to learn new skills
- Attention-to-detail & conscientiousness
- Persistence and self-reliance
- High personal expectations
- Self-efficacy / “can-do” attitude

All of these factors are embedded in the virtuous cycle of High Performance depicted to the right. Current state-of-the-art adaptive learning systems (ALEKS, Cognitive Tutor, Knewton, etc.) personalize primarily with regard to the student’s path through the academic skills. CSM is the first adaptive learning system that personalizes all of these factors – skills, learning, behaviors, and affect and self-identity.



Importantly, the purpose of education and training isn’t simply to acquire skills, but to become a **better learner** (e.g. with solid learning strategies and meta-cognition) and a **better student** (with good behaviors and positive affect and self-identity). That is, if we attend to all aspects of learning, we will build people who will be successful at school, college, work and life.

Focusing on skills acquisition – as most education and training does – treats the symptoms, but not the underlying problems. Another way of saying this is that skills are the only part of the cycle that is not actually under the control of the teacher or student – the student and teacher have much more personal control over learning strategies, behaviors and affect, yet the educational system has almost no curriculum or instruction for learning, behavior and affect, nor does it assess these or provide any accountability for these.

These following sections give more insight and examples into CSM’s next generation adaptive learning, though they represent only a small fraction of the methods used.

## CSM provides adaptive/personalized learning

### CSM is an adaptive learning system

Adaptive learning technology monitor students so as to guide them through the curriculum so that they're always on the edge of knowledge, where things are neither too easy and boring, nor too difficult and frustrating, but "just right" ("Goldilocks' principle", more technically, maintaining the student at their "zone of proximal development").

### CSM analyzes student answers to determine the thinking error

Even when the answer is fill-in-the-blank, CSM analyzes the student input in order to determine the student's specific thinking error, significantly speeding the learning process, and allowing CSM to more accurately distinguishing when the student is still learning (they are making different thinking errors) from when they are stuck (they make the same errors).

### CSM makes high level interpretations about the student every 10 minutes

Every 10 minutes, CSM analyzes the last 2 hours of student work and creates a series of high-level interpretations of student strengths and concerns, which CSM conveys directly to student through the computer interface, as well as communicating to CSM coaches.

### CSM ensures durability of mastery

Most learning systems put a checkmark for the student on a skill as soon as they show initial competency. In CSM, a student earns a yellow belt (karate metaphor) the first time that they gain mastery, and then returns to similar problems a week later. If they show mastery, they go on to their red belt and later their black belt.

### CSM gives frequent and meaningful positive feedback

In most learning systems, positive feedback to the student is surprisingly rare and rote. In contrast, CSM constantly provides meaningful positive feedback. For example, even if a student is stuck on learning a skill, CSM can compliment them on how they've tried to learn – on the lessons that they read, on their persistence, on their high degree of focus, on how they handle frustration, and more.

## CSM teaches students how to learn

### CSM builds better students

The object in CSM isn't to teach students skills – it's the students' job to learn the skills on their own. The focus of CSM and the coach is to teach the student how to do this and make a more effective student – learning more independently, with more persistence and self-efficacy.

### CSM has multiple lessons for every skill

Most learning systems provide only a single lesson for every skill. CSM typically offers 3-8 lessons, including » conceptual lessons » procedural step-by-steps » a step-by-step solution to the most recent problem answered by the student » other solutions (so the student can find the lesson that speaks best to their needs) » tips » similar concepts in other contexts » checking your answer, and more.

### CSM analyzes student reading patterns to build more effective learning strategies

CSM not only provides multiple lessons for each skill, it analyzes how the students read these different lessons. For example, a student might only read short procedural lessons and never the longer conceptual lessons, or might never read lessons until their frustration is too high, or might skim through lessons, rather than read them deeply. Since every student learns differently, CSM

waits to see if they are successful at learning the skill – if they aren't, CSM and/or the coach then guides the student to better learning strategies.

### **CSM asks meta-cognitive questions to produce people who think about their learning**

CSM teaches learning meta-cognition to students – i.e., thinking about learning. E.g., at key times, CSM asks students to reflect whether they know the skill that they're working on (e.g. "Do you now know how to do this skill?" "Do you understand what you did wrong?", etc.). CSM checks to see how accurate they are in answering these questions, and provides intervention for poor meta-cognition.

## **CSM builds traits important for high performance**

### **CSM monitors and responds to issues in learning strategies and performance traits.**

Most adaptive learning programs focus on cognitive issues. CSM recognizes that the main issues for most students are motivation, attitudes, behaviors and feelings. To provide personalized interventions, CSM is continuously monitoring aspects of student behavior – putting "junk" into the system, rapidly hitting the submit key, looking at other windows (e.g. email or Facebook), giving up quickly, etc. CSM interprets student data every 10 minutes, and intervenes directly or through the coach.

### **CSM deals with frustration as a prerequisite to persistence**

In most classes and learning systems, teachers intervene quickly when they see that students are frustrated. In CSM, however, persistence is a central goal, and there is no such thing as persistence without frustration – that is, frustration is not bad, but actually a required "tool" to teach persistence. CSM monitors student frustration (hitting the "submit" key repeatedly, entering junk, repeatedly leaving CSM for other websites), but only intervenes, directly or through the coach, when frustration appears ready to "boil over".

### **CSM requires an extremely high level of mastery/competency**

Most systems have a low competency measure – generally 60-70% on a multiple choice test. This leads in many students to a "casino mentality", where they eliminate a few questions and hope for the best. In CSM, most problems are fill-in-the-blank, and students need to get 100% right, repeat this twice in a few attempts, and then repeat this 1-2 weeks later. Most students have rarely performed at these A-levels of mastery, and thereby learn three things: what it means to do A-level work; that they're capable of A-level work; and finally, the joy of mastery, which thereby allows them to develop intrinsic motivation.

### **CSM deals with learned helplessness**

Many students experience "learned helplessness" -- when they get stuck, they just put their pencil down. They internalize the problem, and assume the issue is with themselves, thinking: *"I can't do this, and everyone else probably can – I'm really dumb. If I try, I still won't be able to do it and then I'll feel worse, so I won't even try."* One of CSM's many interventions for this is that after a student learns a skill, CSM indicates it's difficulty – e.g. "Only 20% of all adults and 40% of college graduates could do that problem". Now the student thinks: *"I can't do the problem not because I'm stupid, but because it's hard. If I spend 5 minutes on it, I can usually do it, and then I'll be doing things most people can't do."* CSM protects students from learned helplessness, and gives them space to try hard things.

## CSM has a new role for coaches

### CSM coaches teach students how to learn

Most teachers focus exclusively on teaching students academic skills. For example, in most blended learning classrooms, the teacher is a “skills fireman” rushing around to respond to students who need help – who will in the future raise their hands 5 minutes earlier to get a private lesson. In CSM, however, the most important lessons are self-reliance, persistence and self-efficacy. Instead, CSM coaches primarily help students learn how to learn on their own, building performance traits (self-reliance, persistence, attention-to-detail, etc.), developing a more positive self-identity and more.

### CSM supplies coaches with highly strategic information

To help coaches focus on learning to learn and performance traits, CSM’s Toolkit provides coaches with continuously updated actionable information. While teacher interfaces for most learning systems are simply a checklist of skills, CSM’s Toolkit monitors student learning strategies, reading effectiveness, frustration levels, distractability, and more. These observations are converted into a prioritized list of major student strengths and concerns, suggested urgent interventions, and more.